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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/212,726	12/15/1998	KLAUS F. SCHUEGRAF	M122-1098	7984

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EXAMINER	
BLUM, DAVID S	
ART UNIT	PAPER NUMBER
2813	

DATE MAILED: 12/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/212,726	SCHUEGRAF, KLAUS F.	
	Examiner	Art Unit	
	David S. Blum	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 September 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *60-62,64 and 66* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *60-62,64 and 66* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *9/14/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

This action is in response to the remarks filed 9/14/05.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims **60**-62, 64 and 66 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,356,722 (**Nguyen** et al.) in view of US 5,593,741 (**Ikeda**) and considered with **Wolf**, et al. Silicon Processing for the VLSI Era, Vol. 1-Process Technology, Lattice Press: Sunset Beach CA, 1986, pp. 166-167, for a showing of inherency only.

Regarding claim 60, **Nguyen** discloses a semiconductor processing method of depositing a SiO_2 layer comprising,

providing a substrate **12** within a cold-wall, chemical vapor deposition (CVD) reactor **10** (Fig. 2);

providing rf power of 300 to 1000 watts, which overlaps 650 watts and a temperature of 350 to 450 °C within the CVD chamber, which overlaps 400 °C, (col. 4, table in lines 33-46);

injecting liquid TEOS into the CVD reactor at a flow rate of 400-1000 sccm, which overlaps 975 sccm (col. 4, table in lines 33-59)(TEOS is a liquid at room temperature, and is in the gas form when injected into the deposition chamber. As best understood by the examiner, the TEOS of the instant claims is also gasified prior to injection, as it is injected at 975 sccm, a gas measurement);

regarding the limitation of 975 sccm, Nguyen forms a nitride containing SiO2 at 400-1000 sccm and a non-nitrogen containing SiO2 at 1000 sccm. The gas flow rate is an example, and not limiting. One skilled in the art would know that the gas flow is dependent upon the chamber size. Therefore the difference between 975 sccm and 1000 sccm is one of mere optimization.

These ranges are considered to involve routine optimization while it has been held to be within the level of ordinary skill in the art. As noted in In re Aller (105 USPQ233), the selection of reaction parameters such as temperature and concentration would have been obvious:

> "Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art. Such ranges are termed "critical ranges and the applicant has the burden of proving such criticality.... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."
>
> In re Aller 105 USPQ233, 255 (CCPA 1955). See also In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmscher 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).

One skilled in the requisite art at the time of the invention would have used any ranges or exact figures suitable to the method in the process of deposition regarding rate flows using prior knowledge, experimentation, and observation with the apparatus used in order to optimize the process and produce the SiO2 layer desired to the parameters desired.

And, decomposing the TEOS to form SiO_2 and depositing the SiO_2 onto the substrate, the decomposing being conducted at a pressure of from about 5 to 15 Torr, which overlaps 10-80 Torr (col. 4, table in lines 33-46).

It is seen to be inherent that the reactor of **Nguyen** is a cold-wall reactor, because the heating of the wafers is via the lamp heater **38** located beneath the wafer **15** (Fig. 2; col. 3, lines 58-66). **Wolf** at pages 166-167 indicates that when the heating comes from within the reaction chamber, that the reactor is called a "cold-wall" reactor, as compared to a "hot-wall" reactor wherein the heating elements are located external to the chamber.

Nguyen does not feed gaseous H_2O_2 into the CVD reactor.

Ikeda also teaches a plasma CVD method of depositing SiO_2 on a semiconductor substrate in a cold-wall CVD reactor using TEOS, oxygen and H_2O_2. **Ikeda** states that the H_2O_2,

> "The obtained film is comparable in film properties to silicon oxide films deposited by known plasma CVD methods and, when the substrate has steps such as aluminum wiring lines, is **better in step coverage and gap filling capability**. The film exhibits a still better profile when hydrogen peroxide gas or an alternative hydrogen containing gas is added to the reactant gas mixture." (Abstract)

Regarding claim 61, **Ikeda** discloses that the gaseous precursors of H_2O_2 **234** and TEOS are independently fed into the CVD reactor (Fig. 11; col. 11, lines 60-62).

Regarding claim 62, **Ikeda** discloses that the precursors of H_2O_2 and TEOS are fed into the CVD reactor simultaneously (Fig. 11; col. 11, lines 60-62).

Regarding claim 64, **Ikeda** inherent feeds gaseous H_2O into the CVD reactor at least because the maximum concentration available is 98% H_2O_2 and because H_2O_2 decomposes into H_2O and O as shown to be inherent in **Ikeda** in the paragraph bridging cols. 11-12.

Regarding claim 66, **Nguyen** (col. 2, lines 16-21) and **Ikeda** (Abstract) each implicitly teach that the substrate has a high aspect ratio and that the SiO_2 is conformally deposited, because the method "provides improved conformality and void-free gap filling" (Nguyen, col. 2, lines 16-21) and is "better in step coverage and gap filling capability" (Ikeda, Abstract). "[I]n considering the disclosure of a reference, it is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw therefrom." *In re Preda*, 401 F.2d 825, 826, 159 USPQ 342, 344 (CCPA 1968) See also *In re Lamberti*, 545 F.2d 747, 750, 192 USPQ 278, 280 (CCPA 1976).

As applied to all of the claims above, it would have been obvious for one of ordinary skill in the art, at the time of the invention to add H_2O_2 to the gas mixture of **Nguyen** in order to gain better profile in step coverage and gap fill over high aspect ratio gaps, as taught by **Ikeda**.

Response to Arguments

3. Applicant's arguments filed 9/14/05 have been fully considered but they are not persuasive.

The applicant argues that the claims are allowable because each and every limitation is not taught by the cited art.

In particular, Nguyen does not teach injecting liquid TEOS into the deposition chamber. Although the instant specification teaches injecting liquid TEOS into the chamber, it also teaches that the TEOS is flowed at a rate of 975 sccm. This is a measurement of gas (standard temperature and pressure of a gas). Therefore, the examiner understands that this refers to a gasified (previous) liquid. This then reads on Nguyen.
If the applicant is actually injecting a liquid into the chamber, the specification is not enabled as there is no teaching as to how to measure a liquid using gas flow rates. Also, the rate of 975 sccm is almost 1 liter per minute. If this were a liquid being decomposed into a gas for deposition within the deposition chamber, the chamber would be prohibitively large. Nominally, a liquid expands 100 times when in a gaseous state. The applicant would then be forming 975 liters of gas per minute (and with less than 2 liters of other gasses). One of ordinary skill in the art can only determine that although using the term "liquid TEOS", the applicant is injecting TEOS in a gaseous state.

The applicant also argues that Nguyen flows TEOS at 1000 sccm when forming a nitrogen containing SiO2. The tables are examples and are not limiting. Also, Nguyen teaches 1000 sccm for forming a non- nitrogen containing SiO2 (also a non-limiting example). As to the 25 sccm variance, this is mere optimization. Without evidence to the contrary, the examiner does not see unexpected results from flowing 975 sccm rather than 1000 sccm. The flow is also dependent upon the chamber size.

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Blum whose telephone number is (571)-272-1687) and e-mail address is David.blum@USPTO.gov .

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr., can be reached at (571)-272-1702. Our facsimile number all patent correspondence to be entered into an application is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

David S. Blum

November 23, 2005